Gold in the News

Recent news from the world of gold science and technology

Gold Mimics Copper in Arthritis Treatment

For decades, gold compounds have been used in the treatment of arthritis symptoms. Recent work by scientists at Birmingham University, UK and published in the *Journal of Biological Chemistry*, has been focused on understanding the mechanisms by which this occurs. Professor Nigel Brown and his co-workers have now proposed that the basis for gold's properties may be related to its effect on copper homeostatis in the arthritic tissue and that by mimicking copper, gold prevents the generation of reactive oxygen species. Read more on-line at http://www.jbc.org

Biohazard Detection Technology

Researchers at Purdue University, USA have reported on how gold nanotechnology might be used to enable microchips to detect biohazards such as bacteria, nerve gas or other chemical agents. According to Jillian Buriak, Associate Professor of chemistry at Purdue's School of Science, the team have developed a technique whereby a semiconductor, for example, Germanium is dipped into a solution of gold based salts to form a layer of high purity gold nanoparticles on the semiconductor. The gold nanoparticles form a bumpy coating on the semiconductor base, providing nooks and crannies in which to secure organic molecules that react in the presence of other chemicals. In theory this means that the organic molecules could be chosen for their ability to react to the presence of nerve gas or biological contaminants. If a dangerous chemical reacts with an organic molecule on the chip, the resulting electrical change would be conveyed by the metal nanoparticles, signalling that a biohazard is present. In effect the gold nanoparticles are providing a 'bridge' between the computer and biological world.
See http://news.uns.purdue.edu/hp/Buriak.nanoparticle.html for further information.

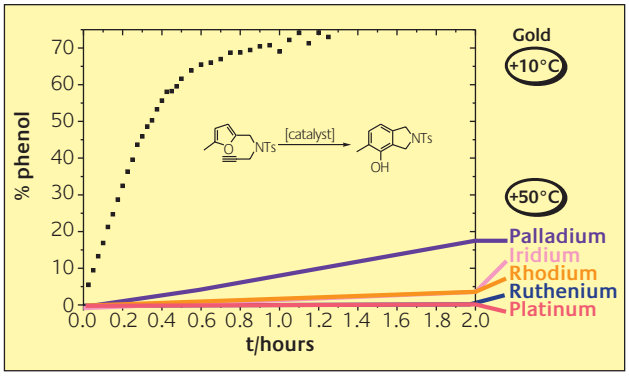

Figure 1

Gold on Mars

Beagle 2 is the British-led lander of the European Space Agency Mars Express mission which launches in May 2003 from Baikonur. A few days before Christmas 2003, Beagle 2 will spin off from Mars Express and will approach the planet

Figure 2
All rights reserved Beagle 2 www.beagle2.com

surface. There it will remotely analyse sub-surface soil, rock interior and atmospheric samples. The upper surface, the solar absorber unit, of the lander is covered in gold coated Kapton which is polyimide film used extensively on spacecraft. Around 1g of gold will be used on this upper surface because it is an excellent solar absorber ie it absorbs more radiative energy in the solar wavelength range than it emits at thermal wavelengths. This means gold-coated surfaces tend to heat up in the sun. The inside surfaces of the lander are also gold coated to minimise the heat loss from instruments by radiation through the walls. Gold also prevents the build up of static electrical charge.

Nanoprobes Inc.'s NANOGOLD® Used in Self-Assembly.

Recent research reported in the *Journal of Nanoparticle Research* has described the self-assembly of metallic nanoparticle arrays using DNA crystals, labeled site-specifically with Nanogold®, as a programmable molecular scaffolding. This represents a critical step toward the realization of DNA nanotechnology and its nanoelectronic applications. The use of 2D DNA crystals as a scaffolding potentially offers fundamental advantages over other self-assembly approaches for the precision, rigidity, and programmability of the assembled nanostructures, and the chemical selectivity of Nanogold labeling lets researchers use the full power of this to organize gold particles. The nanoparticles form precisely integrated components, which are covalently bonded to the DNA scaffolding. Scanning transmission electron microscopy (STEM) showed that the gold particles formed 2-D arrays with interparticle spacings of 4 and 64 nm. For further information see http://ipsapp009.lwwonline.com/content/getfile/5035/15/11/abstract.htm

Leap in Gold Catalyst Technology

Gold alloy catalysts are now being used in the commercial production of vinyl acetate monomer (VAM). BP Chemical's VAM plant at Hull in the UK uses the new 'Leap Process' in the production of the monomer, which is essential in the manufacture of emulsion-based paints, wallpaper paste and wood glue. According to an article in the BP magazine of technology and innovation, *Frontiers*, the development work on the new process catalyst took only 7 years to complete. The gold-palladium catalyst formulation was chosen after extensive screening by BP technologists in the UK and the US. In collaboration with catalyst manufacturer Johnson Matthey, BP then developed appropriate methods to manufacture the gold-palladium alloy catalyst on a commercial scale, with control of the location of the active metals on the support material. The cost-effective fluidised-bed process was proven under small pilot plant conditions before a computer model was used to put the chemistry and the large-scale process dynamics together and achieve the required scale-up factor of 14,000 in a single step! At the end of 2001, the full production plant was successfully commissioned. This fluidised bed process represents a capital saving of 30% compared with the fixed bed technology used previously. In June this year, the 'Leap Process' won the AspenTech Award for Business Innovation at the 2002 Institution of Chemical Engineers Awards. The 'Leap Process' encompasses the first reported use of a gold catalyst in a fully developed largescale chemical process. Patents relating to this and similar gold catalyst technologies can be found at: http://www.gold.org/value/sci_indu/gold_catalysts

For further information see the external link below: http://www.bp.com/company_overview/technology/frontiers/fr04aug02/fr04leapavada.asp

Biomedical Nano-applications in Taiwan

A National Science Council project led by Professor Jay Chia-chun Chen of the National Taiwan Normal University has recently unveiled a new US patented technique which involves the use of a gold based nanoparticle and a single molecule of sugar. Bound together they can be used as a marker to identify specific strains of bacteria under fluorescent microscopy. This new tool for biomedical diagnostic testing is claimed to exhibit increased sensitivity and lower detection limits than current technology. It is also said to be non-toxic and can be used on live cells.
For further information see:
http://www.etaiwannews.com/Taiwan/2003/01/17/1042773304.htm